Fig. 1.

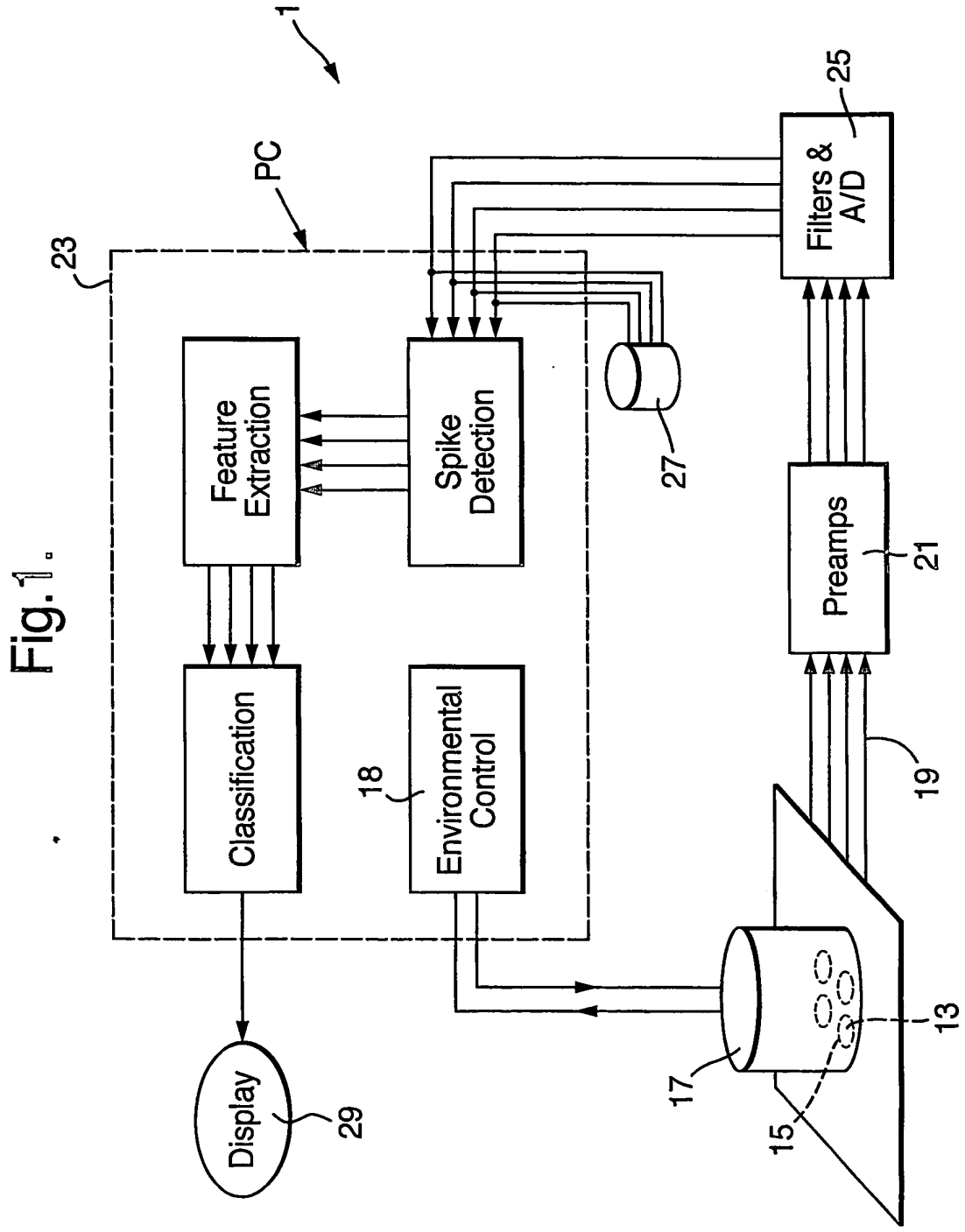

1
PC
23
25
Filters & A/D
Feature Extraction
Spike Detection
27
Preamps
21
Classification
18
Environmental Control
19
13
17
15
Display
29

Fig.2.

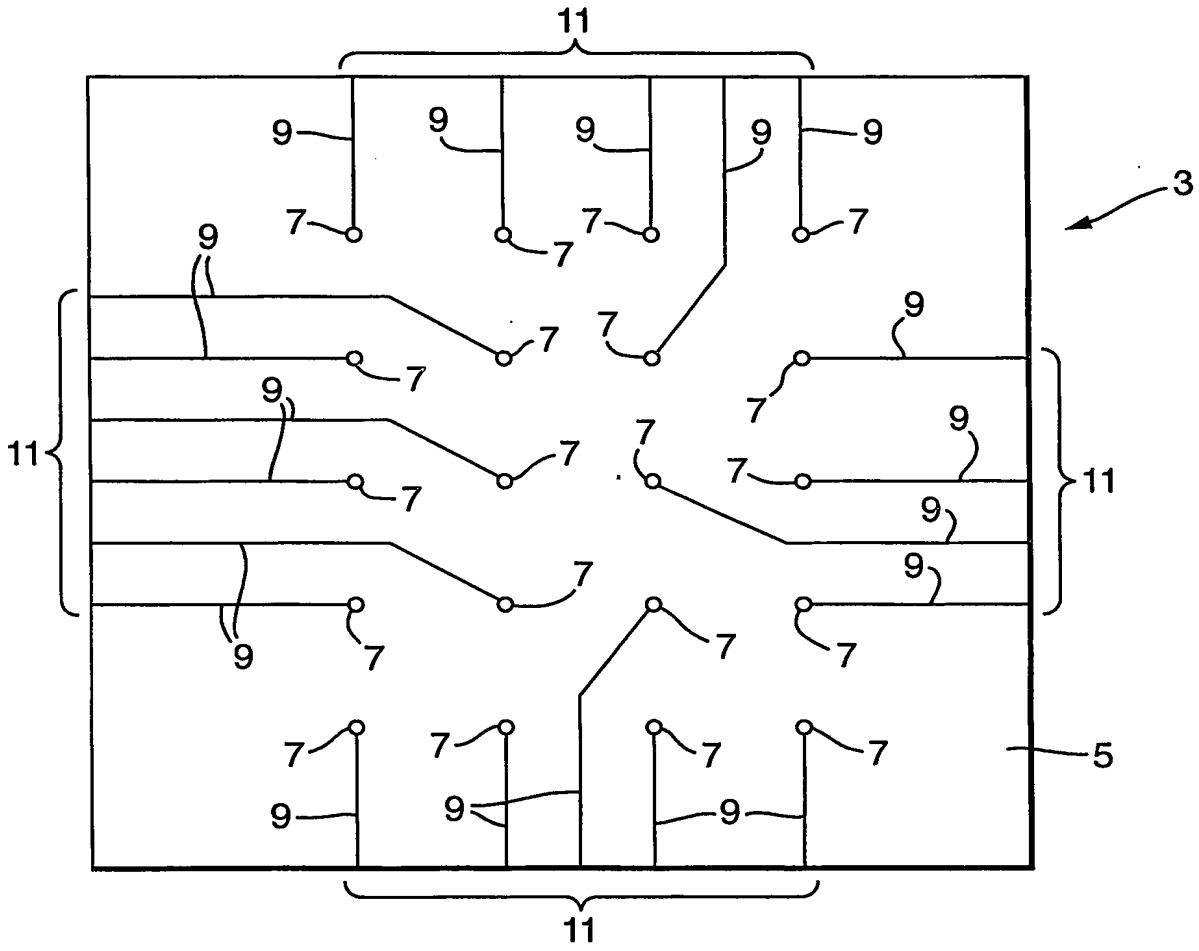
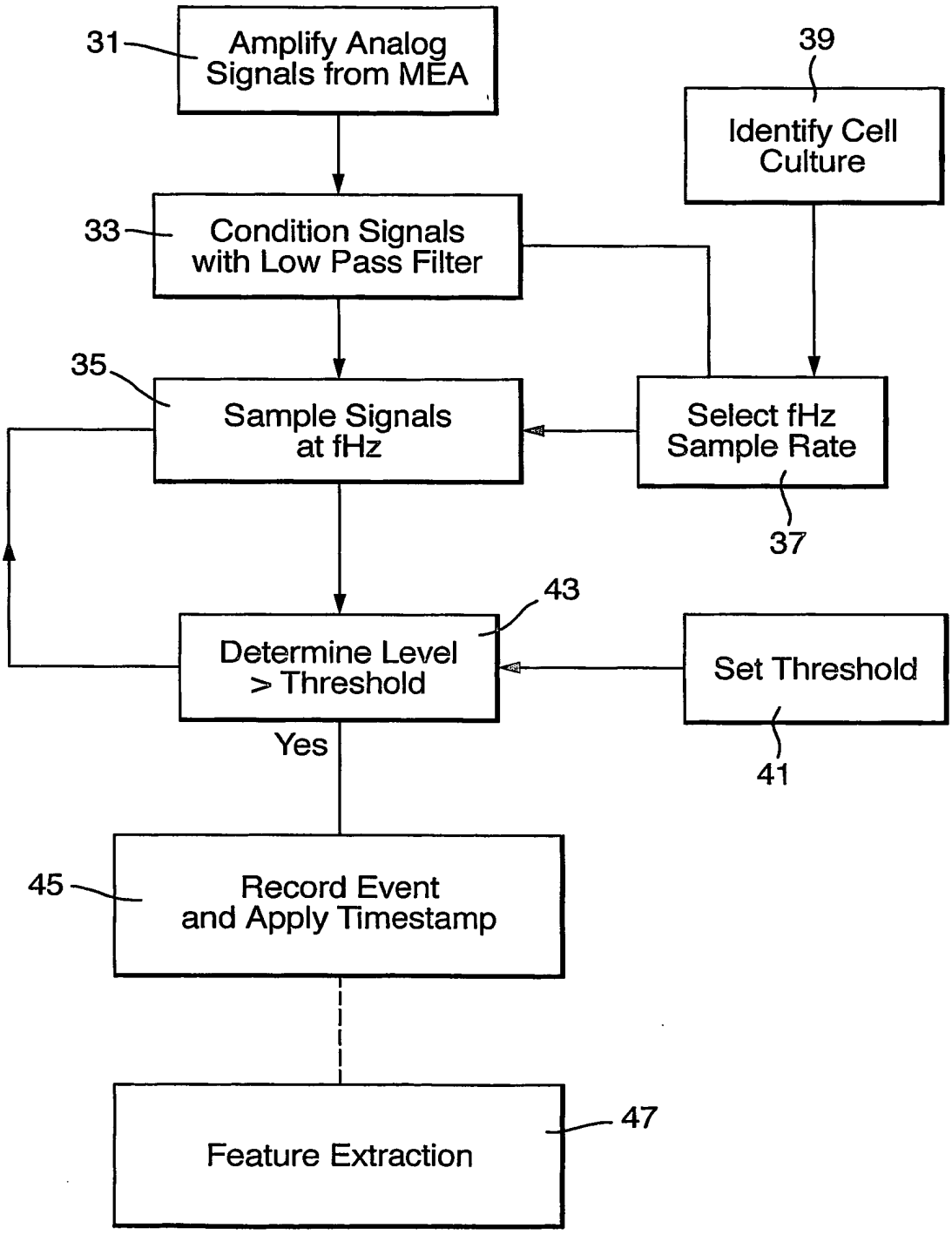


Fig.3.


31
Amplify Analog Signals from MEA
39
Identify Cell Culture
33
Condition Signals with Low Pass Filter
35
Sample Signals at fHz
Select fHz Sample Rate
37
43
Determine Level > Threshold
Set Threshold
41
Yes
45
Record Event and Apply Timestamp
Feature Extraction
47

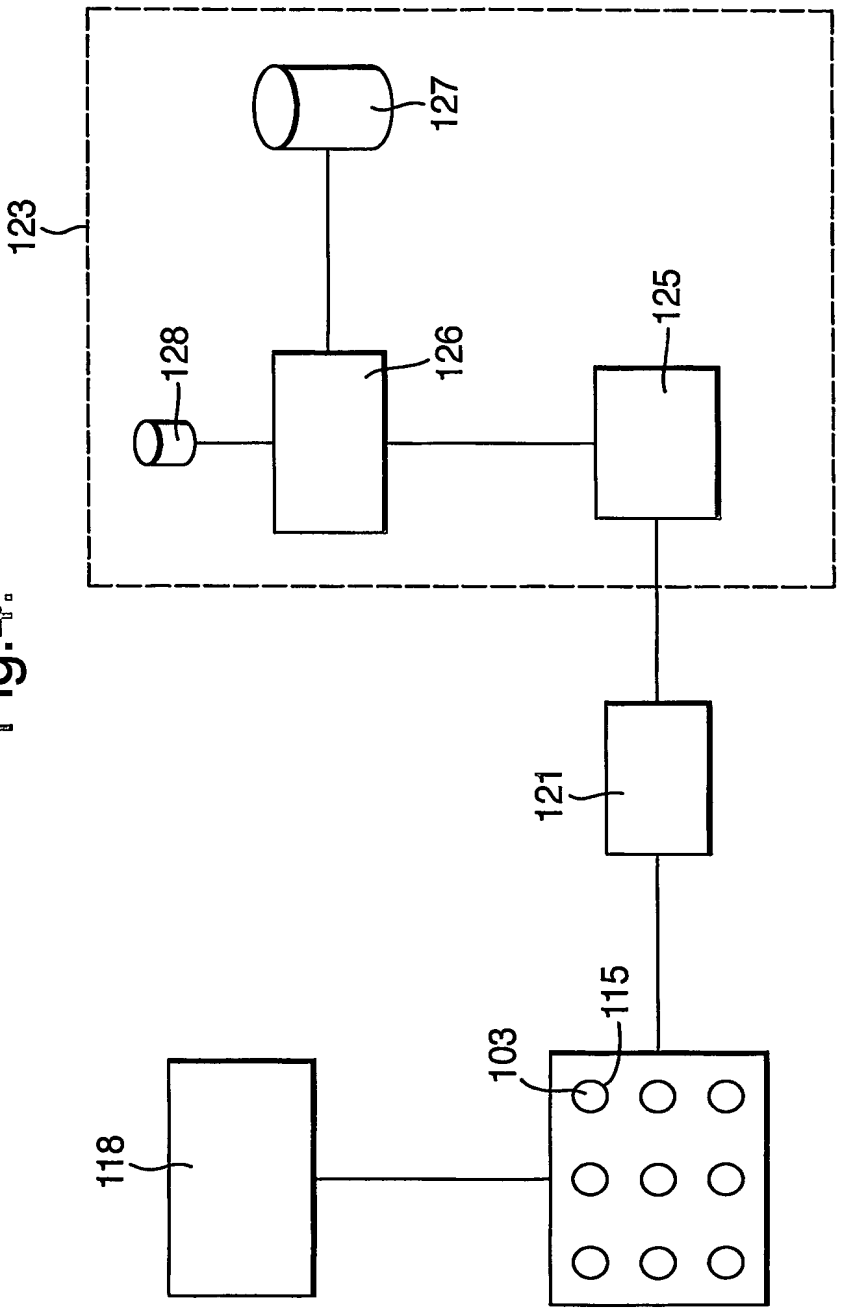


Fig.4.

Fig.5.

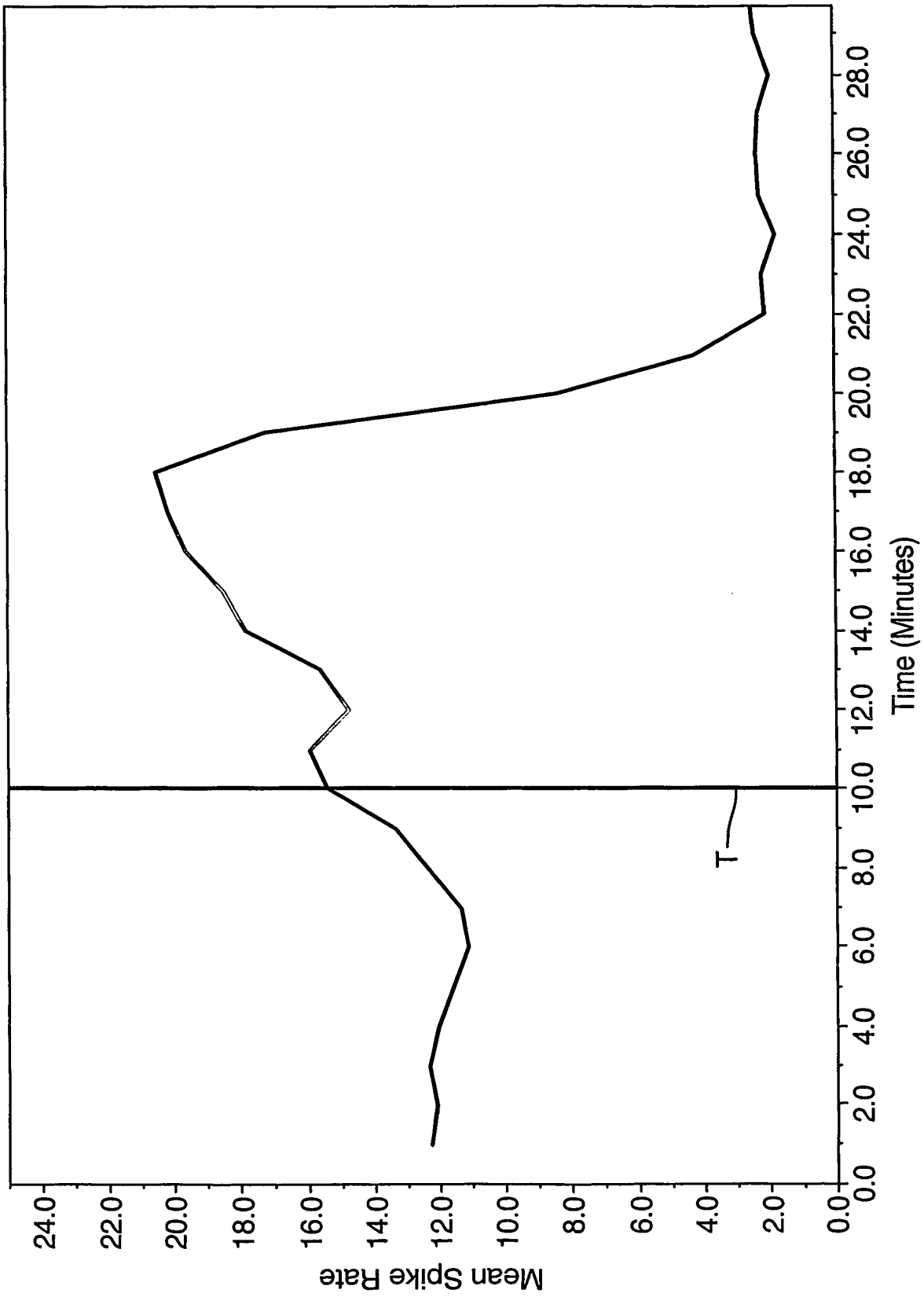

Mean Spike Rate
Time (Minutes)
T
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
22.0
24.0
26.0
28.0

Fig.6.

Program	Feature No.	Name	Description	Type of t-test
spike_rate	1	isr	instantaneous spike rate	unpaired
spike_rate	2	isrv	instantaneous spike rate variability	unpaired
spike_speed	3	ss	spike speed	unpaired
spike_speed	4	ssv	spike speed variability	unpaired
max_min	5	maxv	peak level	paired
max_min	6	minv	trough level	paired
max_min	7	rangev	peak-to-trough level	paired
max_min	8	maxmodv	absolute peak level	paired
rise_times	9	rise10_time	rise time from 10% of peak	paired
rise_times	10	rise20_time	rise time from 20% of peak	paired
rise_times	11	recov10_time	recovery time to 10% of peak	paired
rise_times	12	recov20_time	recovery time to 20% of peak	paired
rise_times	13	diffv	peak-to-trough time	paired
rise_times	14	qt	time from 3% and 97% of absolute profile area	paired
rise_times	15	dec_mpt	decay rate of profile tail	paired
spike_area	16	mean_abs	absolute profile area	paired
spike_area	17	mean_rise	profile rise area	paired
spike_area	18	mean_abs_recov	absolute profile recovery area	paired
moments	19	mom	turning moment of profile	paired
moments	20	cog	centre of gravity of absolute profile	paired
moments	21	rog	radius of gyration of absolute profile	paired
spectrum	22	varv	amplitude variance	paired
spectrum	23	maxspec	maximum power spectral value	paired
spectrum	24	locmaxspec	frequency of maximum power spectral value	paired
spectrum	25	spec1	amplitude variance (normalised) in band 1	paired
spectrum	26	spec2	amplitude variance (normalised) in band 2	paired
spectrum	27	spec3	amplitude variance (normalised) in band 3	paired
specrtum	28	spec4	amplitude variance (normalised) in band 4	paired
spectrum	29	spec2re1	amplitude variance band 2 relative to band 1	paired
spectrum	30	swpec3re2	amplitude variance band 3 relative to band 2	paired
spike_hos	31	ccv	amplitude correlation coefficient	1-sided
spike_hos	32	skew	amplitude skewness (normalised)	paired
spike_hos	33	kurt	amplitude kurtosis (normalised)	paired
entropy	34	ent	entropy of profile	paired
entropy	35	enta	entropy of absolute profile	paired
wavelets	36	wmaxv	maximum wavelet transform coefficient	paired
wavelets	37	scale_maxmaxv	scale of wavelet transform coefficient	paired
wavelets	38	wvv	variance of wavelet transform	paired
wavelets	39	wtrfv	wavelet transform transfer coefficient	unpaired
wavelets	40	wvmv	variance of wavelet transform ridge values	paired
wavelets	41	wtrfmv	wavelet transform ridge value transfer coefficient	unpaired

Fig. 7.

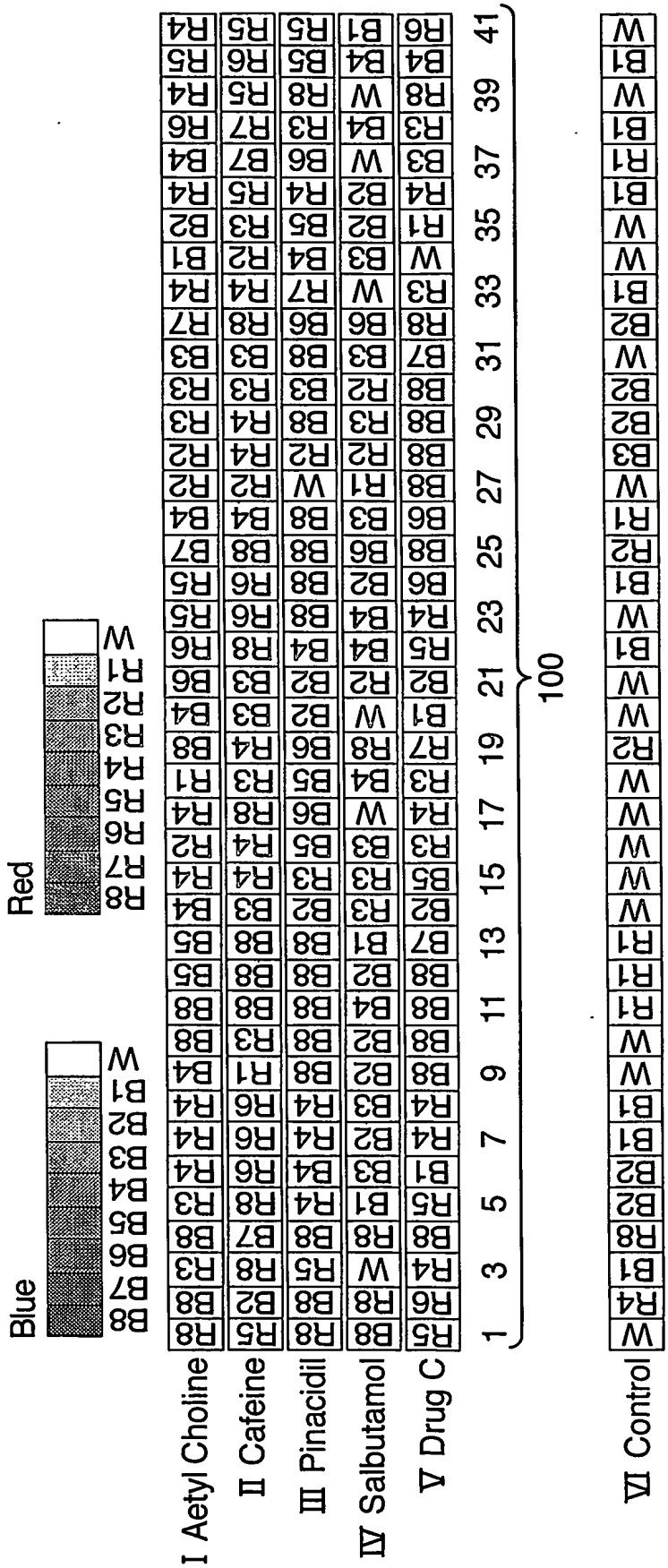
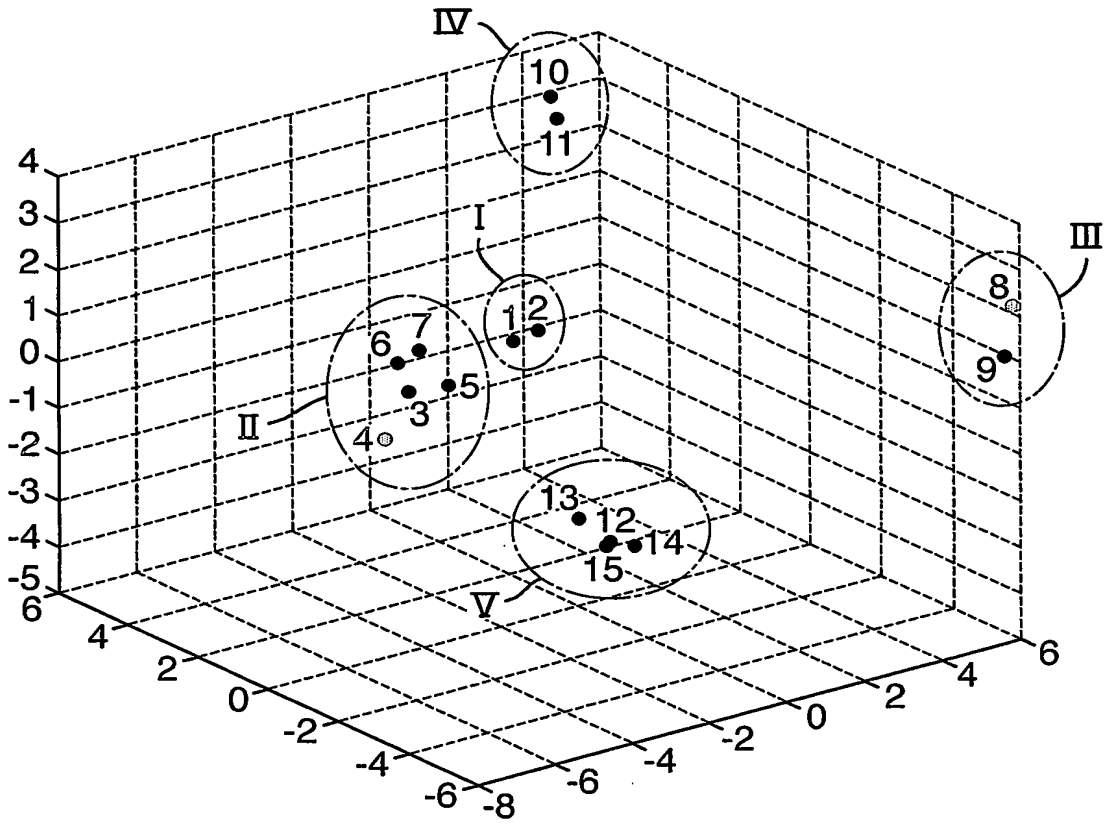

Blue
B8 B7 B6 B5 B4 B3 B2 B1 W
Red
R8 R7 R6 R5 R4 R3 R2 R1 W
I Aetyl Choline
II Cafeine
III Pinacidil
IV Salbutamol
V Drug C
VI Control
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41
100

Fig.8.


IV
10
11
I
III
8
1
2
6
7
9
5
3
II
4
13
12
14
15
V
4
3
2
1
0
-1
-2
-3
-4
-5
6
4
2
0
-2
-4
-6
-8
6
4
2
0
-2
-4
-6